



BH Measurement of AL800 Ring

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Booster 2nd Harmonic Cavity Meeting

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Goal

Develop a method and experimental apparatus to measure the BvH curve for sample ring of AL-800.



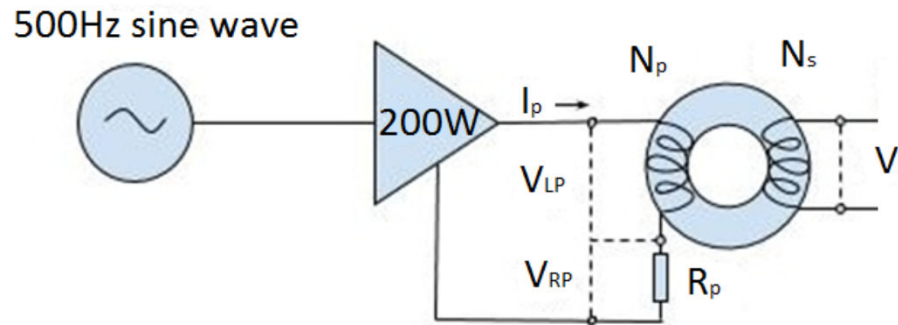
AL800 Garnet ring



Ns: 259 turns, one layer
25awg, 1x2 flat wire

Np: 250 turns, three layers
15awg, 1x2 flat wire

Circuit Design



$$N_p = 250$$

$$L_p = \frac{\mu N_p^2 A}{2\pi r}$$

$$I_p = \frac{V_{RP}}{R_p} \approx 7A \text{ peak}$$

$$H(t) = \frac{N_p^2 I_p(t)}{2\pi r}$$

$$N_s = 259$$

$$R_p = 4.2$$

$$A = 0.7 \times 10^{-4} m^2$$

$$r = 0.0366m$$

$$L_s = \frac{\mu N_s^2 A}{2\pi r}$$

$$V_I = \frac{1}{R_I C_I} \int V_s(t) dt$$

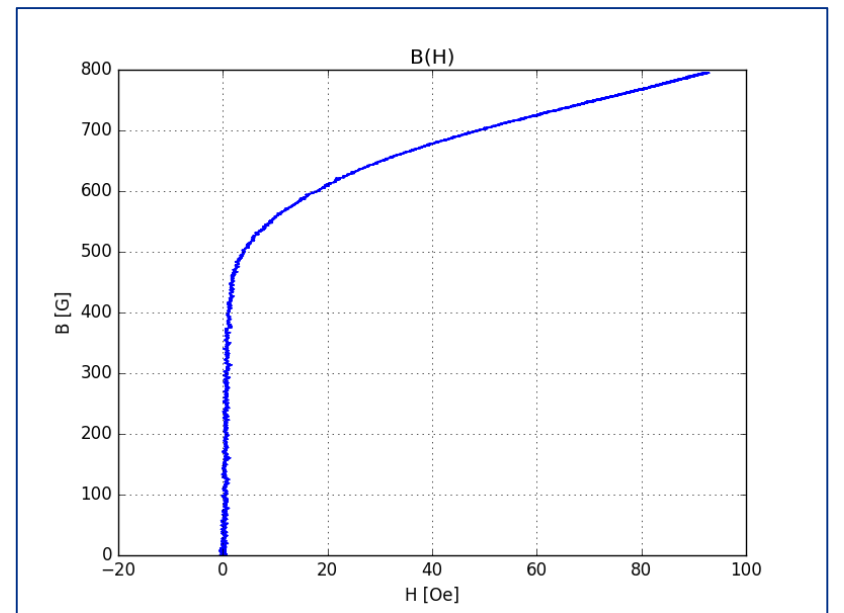
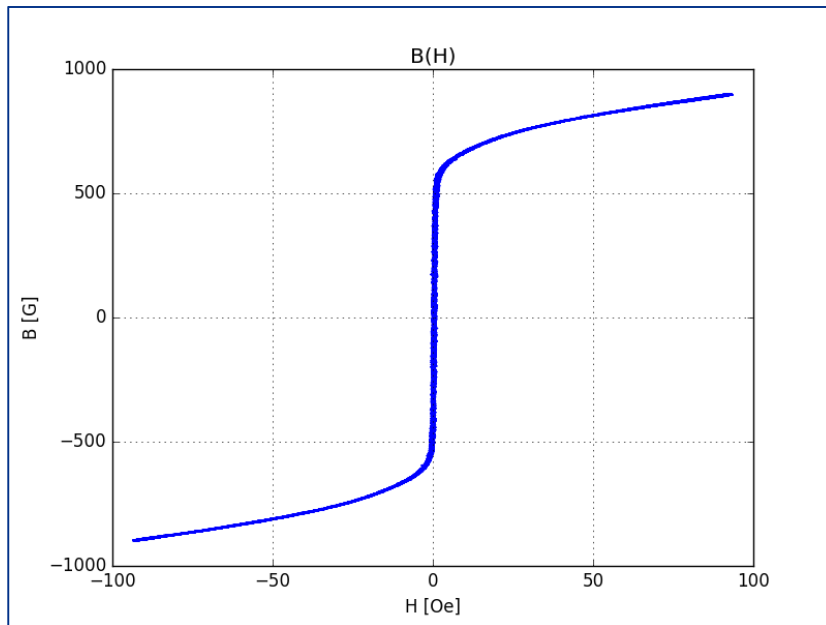
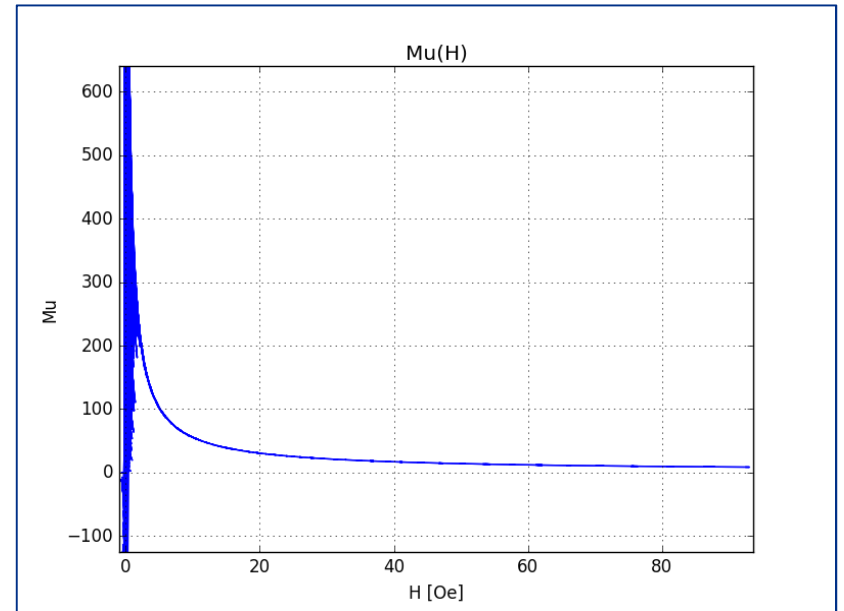
$$B(t) = \frac{1}{N_s A} \int V_s(t) dt = \frac{1}{N_s A} \int R_I C_I \frac{dV_I(t)}{dt} dt = \frac{R_I C_I}{N_s A} V_I(t)$$

Changes from previous design:

- Removed RC integrator
- Reduced primary resistor from 8 to 4 ohm.
- Increased power

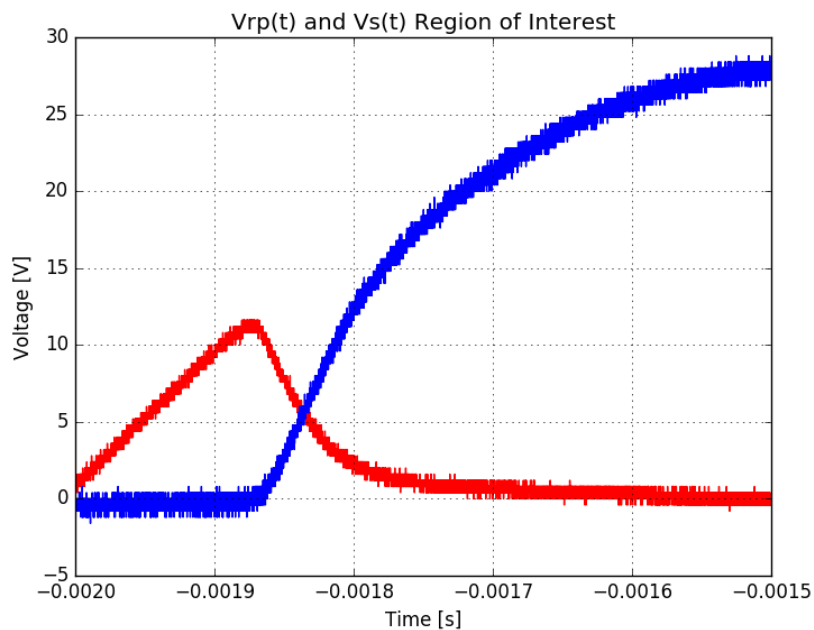
Results

- Narrow hysteresis curve
- $\mu(H)$ has noise at low H but expected results at high H

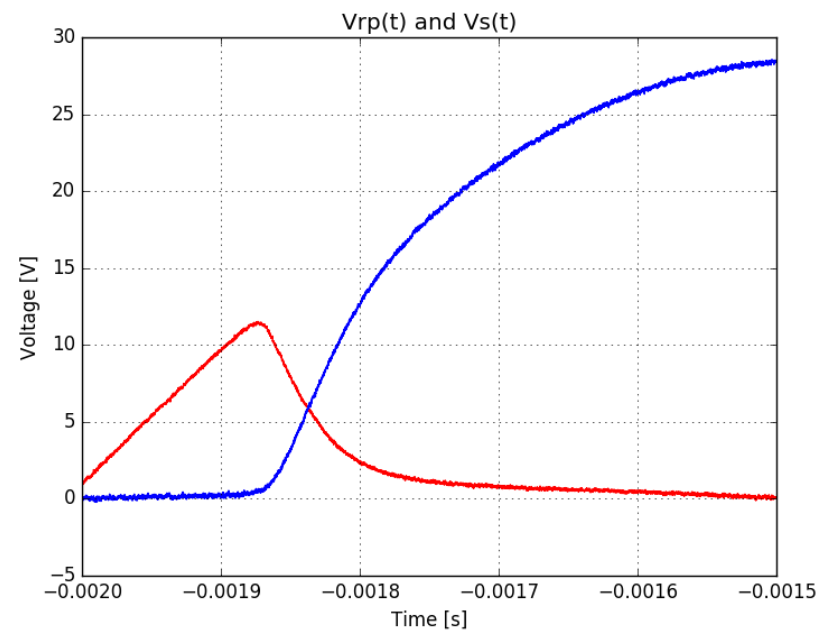


Analysis Improvements

- New Python program for faster analysis and numerical integration.
- Data smoothing.
- Scope offset correction.



Before processing



After processing

Summary

- Measure BvH on AI-800 ring with 200+ Oe.
- Better amplifier, 60W available
- More turns on the windings, 500
- Numerical integration

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- ✓ Measure BvH on AI-800 ring with ~~200+ Oe.~~ ~100 Oe
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Moving Forward

- Fine tune analysis and error propagation
- Clean up noise in measurement
- Another toroid winding with more turns???